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LaSalle Parish, Louisiana

National Eutrophication Survey, Las Vegas, Nev

Prepared for

Environmental Monitoring and Support Lab, Las Vegas, Nev

Mar 77

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Report
on
Saline Lake
LaSalle Parish
Louisiana
EPA Region VI
Working Paper No. 542

With the cooperation of the
Louisiana Wild Life and Fisheries Commission
and the
Louisiana National Guard
March, 1977

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16 ABSTRACT

Annual total phosphorus and total nitrogen loadings to the lake were estimated and subdivided according to either point or non-point source origin. An assessment of the lake's trophic condition and limiting nutrient is also provided. All data collected by the U.S.E.P.A. National Eutrophication Survey during the one year study of the lake and its tributaries are included in the report.

17 KEY WORDS AND DOCUMENT ANALYSIS

a DESCRIPTORS	b IDENTIFIERS/OPEN-ENDED TERMS	c COSATI Field/Group
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REPORT ON SALINE LAKE

LASALLE PARISH, LOUISIANA

EPA REGION VI

by

National Eutrophication Survey

Water and Land Quality Branch
Monitoring Operations Division
Environmental Monitoring & Support Laboratory
Las Vegas, Nevada

and

Special Studies Branch
Corvallis Environmental Research Laboratory
Corvallis, Oregon

Working Paper No. 542

OFFICE OF RESEARCH AND DEVELOPMENT
U.S. ENVIRONMENTAL PROTECTION AGENCY

March 1977

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FOREWORD

The National Eutrophication Survey was initiated in 1972 in response to an Administration commitment to investigate the nationwide threat of accelerated eutrophication to freshwater lakes and reservoirs.

OBJECTIVES

The Survey was designed to develop, in conjunction with state environmental agencies, information on nutrient sources, concentrations, and impact on selected freshwater lakes as a basis for formulating comprehensive and coordinated national, regional, and state management practices relating to point source discharge reduction and nonpoint source pollution abatement in lake watersheds.

ANALYTIC APPROACH

The mathematical and statistical procedures selected for the Survey's eutrophication analysis are based on related concepts that:

a. A generalized representation or model relating sources, concentrations, and impacts can be constructed.

b. By applying measurements of relevant parameters associated with lake degradation, the generalized model can be transformed into an operational representation of a lake, its drainage basin, and related nutrients.

c. With such a transformation, an assessment of the potential for eutrophication control can be made.

LAKE ANALYSIS

In this report, the first stage of evaluation of lake and watershed data collected from the study lake and its drainage basin is documented. The report is formatted to provide state environmental agencies with specific information for basin planning [§303(e)], water quality criteria/standards review [§303(c)], clean lakes [§314(a,b)], and water quality monitoring [§106 and §606(b)] activities mandated by the Federal Water Pollution Control Act Amendments of 1972.

Beyond the single lake analysis, broader based correlations between nutrient concentrations (and loading) and trophic condition are being made to advance the rationale and data base for refinement of nutrient water quality criteria for the Nation's freshwater lakes. Likewise, multivariate evaluations for the relationships between land use, nutrient export, and trophic condition, by lake class or use, are being developed to assist in the formulation of planning guidelines and policies by the U.S. Environmental Protection Agency and to augment plans implementation by the states.

ACKNOWLEDGMENTS

The staff of the National Eutrophication Survey (Office of Research and Development, U.S. Environmental Protection Agency) expresses sincere appreciation to the Louisiana Wild Life and Fisheries Commission, Division of Water Pollution Control for professional involvement, to the Louisiana National Guard for conducting the tributary sampling phase of the Survey, and to those Louisiana wastewater treatment plant operators who provided effluent samples and flow data.

Robert A. Lafleur, Chief; J. Dale Givens, Assistant Chief; Lewis R. Still, Biologist; Louis Johnson, Biologist; Lee Caubarreaux, Biologist; Darrell Reed, Engineer; Dempsey Alford, Biologist; and Elwood Goodwin, Water Quality Control Technician, all of the Louisiana Wild Life and Fisheries Commission, Division of Water Pollution Control reviewed the preliminary reports and provided critiques most useful in the preparation of this Working Paper Series.

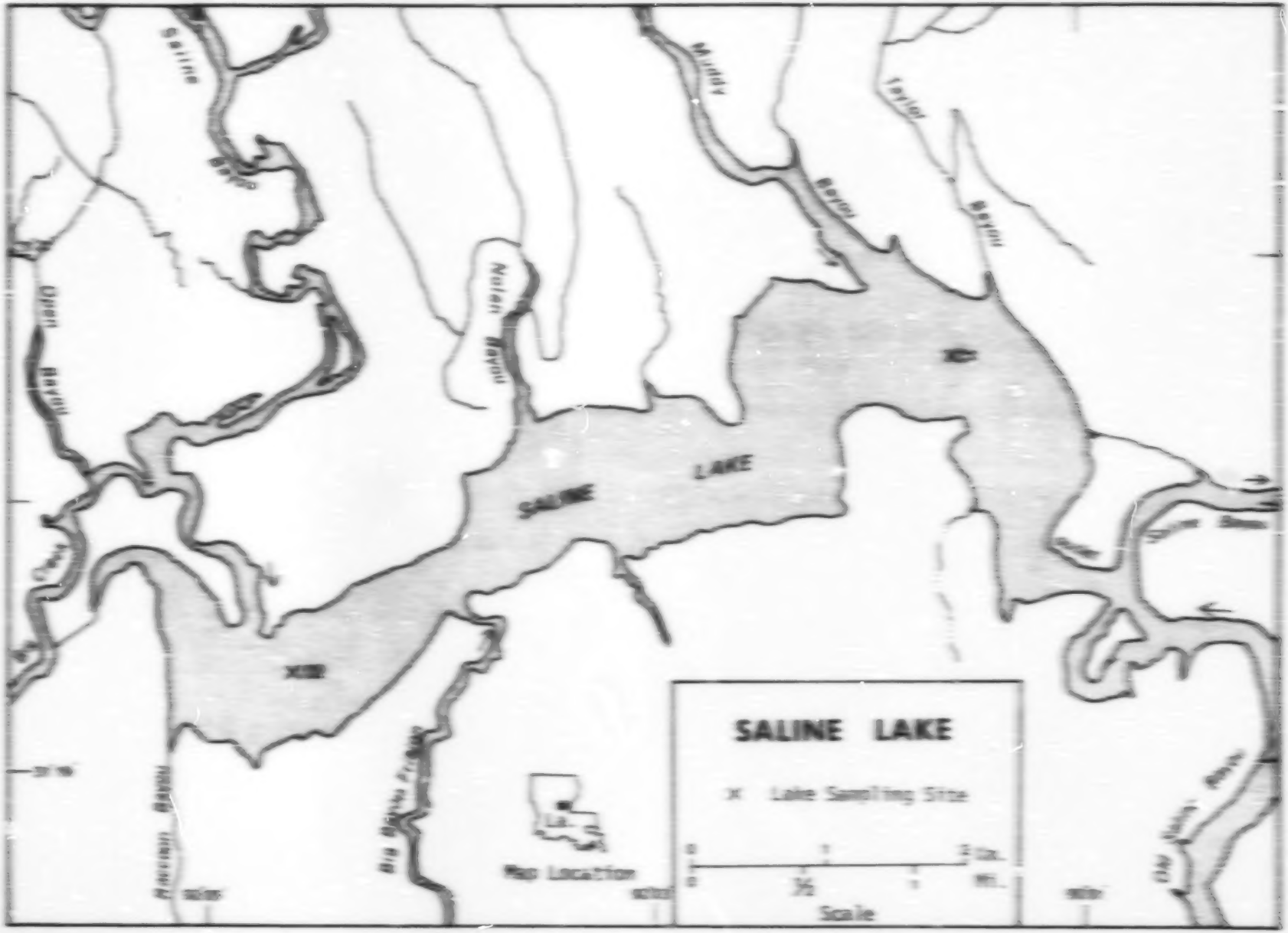
Major General O'Neil Daigle, Jr., the Adjutant General of Louisiana, and Project Officer Colonel Lawrence P. Dupre, who directed the volunteer efforts of the Louisiana National Guardsmen, are also gratefully acknowledged for their assistance to the Survey.

NATIONAL EUTROPHICATION SURVEY

STUDY LAKES

STATE OF LOUISIANA

LAKE NAME	PARISH
Anacoco Lake	Vernon
Lake Bistineau	Bienville, Webster
Black Bayou	Caddo
Black Lake	Natchitoches and Red River
Bruin Lake	Tensas
Bundick Lake	Beauregard
Caddo Lake	Caddo (Menon and Harrison in Texas)
Cocrdrie Lake	Concordia
Cocodrie Lake (Lower)	Rapides
Concordia Lake	Concordia
Cotile Lake	Rapides
Cross Lake	Caddo
D'Arbonne Lake	Union
False River Lake	Pointe Coupee
Indian Creek Reservoir	Rapides
Saline Lake	LaSalle
Turkey Creek Lake	Franklin
Lake Vernon	Vernon
Lake Verret	Assumption


Saline
Bayou
Marsh
Bayou
Taylor
Bayou
Nolan Bayou
Open
Bayou
SALINE
LAKE
Chute
Big Saline Lake
Alexandria Bayou
SALINE LAKE
Lake Sampling Site
Map Location
0
1
2 Km.
0
½
Mi.
Scale

REPORT ON SALINE LAKE, LOUISIANA

STORET NO. 2214

I. INTRODUCTION

Saline Lake was included in the National Eutrophication Survey (NES) as a water body of interest to the Louisiana Stream Control Commission and Louisiana Wild Life and Fisheries Commission. Tributaries and nutrient sources were not sampled, and this report relates only to the data obtained from lake sampling.

II. CONCLUSIONS

A. Trophic Condition:*

Survey data indicate that Saline Lake is eutrophic, i.e., nutrient rich and highly productive. Whether such nutrient enrichment is to be considered beneficial or deleterious is determined by its actual or potential impact upon designated beneficial water uses.

Potential for primary production as measured by algal assay control yield was high. Chlorophyll a values ranged from 4.6 µg/l in the fall to 34.9 µg/l in the summer, with a mean of 15.3 µg/l. Of the 19 Louisiana lakes sampled in 1974, 3 had higher median total phosphorus, 4 had higher orthophospharus, 1 had higher median inorganic nitrogen and none had lower Secchi disc visibility than Saline Lake.

*See Appendix C.

Survey limnologists did not report any nuisance conditions in the lake.

B. Rate-Limiting Nutrient:

Autumn algal assay results suggest that Saline Lake was growth limited by available phosphorus levels. Spikes with phosphorus, or nitrogen and phosphorus simultaneously resulted in increases in assay yield. No growth response accompanied the addition of nitrogen. The lake inorganic nitrogen to orthophosphorus (N/P) ratios indicate phosphorus limitation in summer and fall, and nitrogen limitation in the spring. However, production in the highly turbid waters was more likely limited by available light, at least during spring and fall sampling periods, than by nutrients.

III. LAKE CHARACTERISTICS

A. Lake Morphometry:*

A. Surface area: 7.90 km^2.
B. Mean depth: 2.7 meters.
C. Maximum depth: 5.3 meters.
D. Volume: 21.546 x 10^6 m^3.

B. Precipitation:

A. Year of sampling: 165.8 cm.
B. Mean annual: 151.6 cm.

*Provided by the State of Louisiana.

IV. LAKE WATER QUALITY SUMMARY

Saline Lake was sampled three times during the open-water season of 1974 by means of a pontoon-equipped Huey helicopter. Each time, samples for physical and chemical parameters were collected from two stations on the lake and from one or more depths at each station (see map, page v). During each visit, depth-integrated samples were collected from each station for chlorophyll *a* analysis and phytoplankton identification and enumeration. During the first and last visits, 18.9-liter depth-integrated samples were composited for algal assays. Maximum depths sampled were 4.3 meters at Station 01 and 3.0 meters at Station 02. For a more detailed explanation of NES methods, see NES Working Paper No. 175.

The results obtained are presented in full in Appendix C and are summarized in IV-A for waters at the surface and at the maximum depth for each site. Results of the phytoplankton counts and chlorophyll *a* determinations are included in IV-B. Results of the limiting nutrient study are presented in IV-C.

E. Biological Characteristics:

1. Phytoplankton -

Sampling Date	Dominant Genera	Algal Units per ml
03/19/74	1. Flagellates	1,244
	2. Dactylococcopsis	474
	3. Melosira	237
	4. Cruciginia	237
	5. Dinobryon	118
	Other genera	531
	Total	2,841
05/29/74	1. Flagellates	909
	2. Melosira	795
	3. Ankistrodesmus	625
	4. Kirchneriella	454
	5. Nitzschia	454
	Other genera	1,423
	Total	4,660
11/12/74	1. Melosira	287
	2. Nitzschia	172
	3. Cryptomonas	115
	4. Flagellates	57
	5. Trachelomonas	57
	Other genera	[illegible]
	Total	688

2. Chlorophyll A

Sampling Date	Station Number	Chlorophyll A (ug/l)
03/19/74	01	7.4
	02	10.1
05/29/74	01	34.9
	02	29.7
11/12/74	01	4.6
	02	5.3

C. Limiting Nutrient Study:

1. Autoclaved, filtered, and nutrient spiked - 11/12/74

Spike(mg/l)	Ortho P Conc.(mg/l)	Inorganic N Conc.(mg/l)	Maximum yield (mg/l dry wt.)
Control	0.035	0.739	5.2
0.05 P	0.085	0.739	17.6
0.05 P + 1.0 N	0.085	1.739	26.6
1.00 N	0.035	1.739	6.0

2. Discussion -

The control yield of the assay alga, Selenastrum capricornutum, indicates that the potential for primary production in Saline Lake was high at the time of autumn assay sample collection. The increase in yield with the addition of phosphorus as well as the lack of significant response to the addition of nitrogen indicates phosphorus limitation. Maximum yield was achieved with the simultaneous addition of both nutrients.

It should be noted that significant chemical changes took place in Louisiana lake samples between collection and assay analysis. The assay data should be considered in this context and until such differences are resolved, used with caution for any predictions of actual lake conditions. Such chemical changes are likely to alter the control yield as well as modifying the N/P ratio. The spring algal assay results have not been included as these substantial changes in nutrient levels have removed their information value.

The N/P ratios in the summer and fall lake chemistry samples were respectively 17/1 and 13/1, indicating phosphorus limitation at these times. The spring N/P ratio was 8/1, suggesting nitrogen limitation (a mean N/P ratio of 14/1 or greater generally reflects phosphorus limitation).

V. LITERATURE REVIEWED

U.S. Environmental Protection Agency. 1975. National Eutrophication Survey Methods 1973-1976. Working Paper No. 175. National Environmental Research Center, Las Vegas, Nevada, and Pacific Northwest Environmental Research Laboratory, Corvallis, Oregon.

VI. APPENDICES

APPENDIX A
CONVERSION FACTORS

CONVERSION FACTORS

Hectares x 2.471 = acres

Kilometers x 0.6214 = miles

Meters x 3.281 = feet

Cubic meters x 8.107×10^{-4} = acre/feet

Square kilometers x 0.3861 = square miles

Cubic meters/sec x 35.315 = cubic feet/sec

Centimeters x 0.3937 = inches

Kilograms x 2.205 = pounds

Kilograms/square kilometer x 5.711 = lbs/square mile

APPENDIX D
PHYSICAL AND CHEMICAL DATA

[illegible]

[illegible]

[illegible]												
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[illegible]												

APPENDIX C

PARAMETRIC RANKINGS OF LAKES SAMPLED BY NES IN 1974

STATE OF LOUISIANA

LAKE DATA TO BE USED IN [illegible]

LAKE CODE	LAKE NAME	[illegible] TITUDE °	[illegible] [illegible] °	[illegible] [illegible]	[illegible] [illegible]	[illegible] [illegible]	[illegible] [illegible] °
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